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Cetnar

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(54) **POWER RELEASE DOUBLE-LOCKING LATCH**

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(52) **U.S. Cl.** **70/257**; 70/237; 70/277; 70/278.7; 292/201; 292/216; 292/DIG. 23

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See application file for complete search history.

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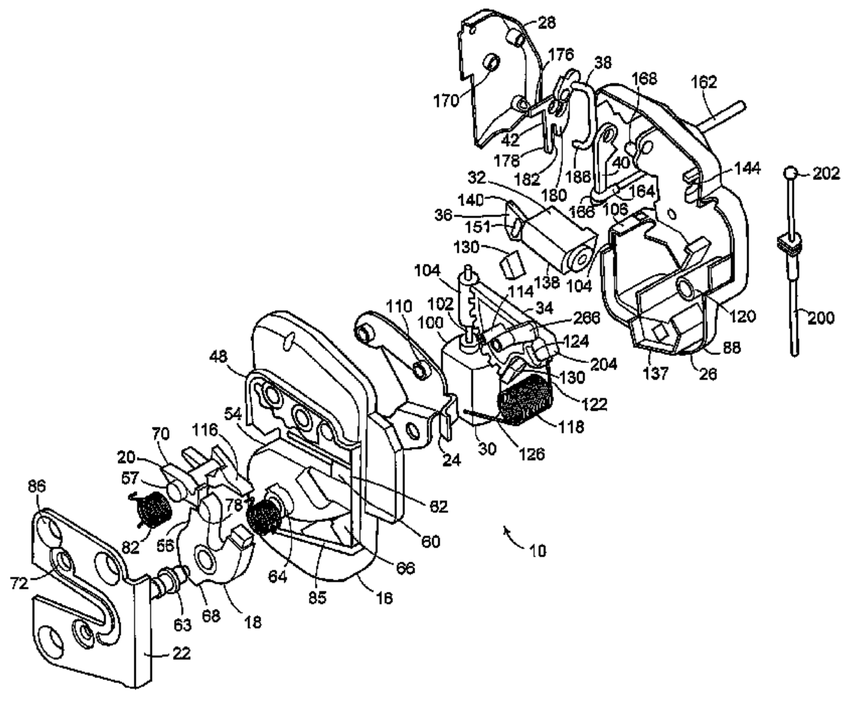
(57) **ABSTRACT**

A power-release door lock system for an automotive door having a latch, including a ratchet (**18**) and pawl (**20**), and an electro-mechanical exterior latch release mechanism (**220**) for actuating the pawl to release the ratchet. The system includes a controller (**210**) and a pressure sensitive switch (**216**) mounted to an outside door handle (**214**) of the automotive door and electrically connected to the controller. The controller is programmed to disable the pressure sensitive switch in response to a predetermined "lock" signal and enable the pressure sensitive switch in response to a predetermined "unlock" signal, in which case the controller energizes the exterior latch release mechanism to release the ratchet in the event the pressure sensitive switch is actuated. The system eliminates the need for an exterior lock assembly and its attendant inside lock button or rod.

23 Claims, 10 Drawing Sheets



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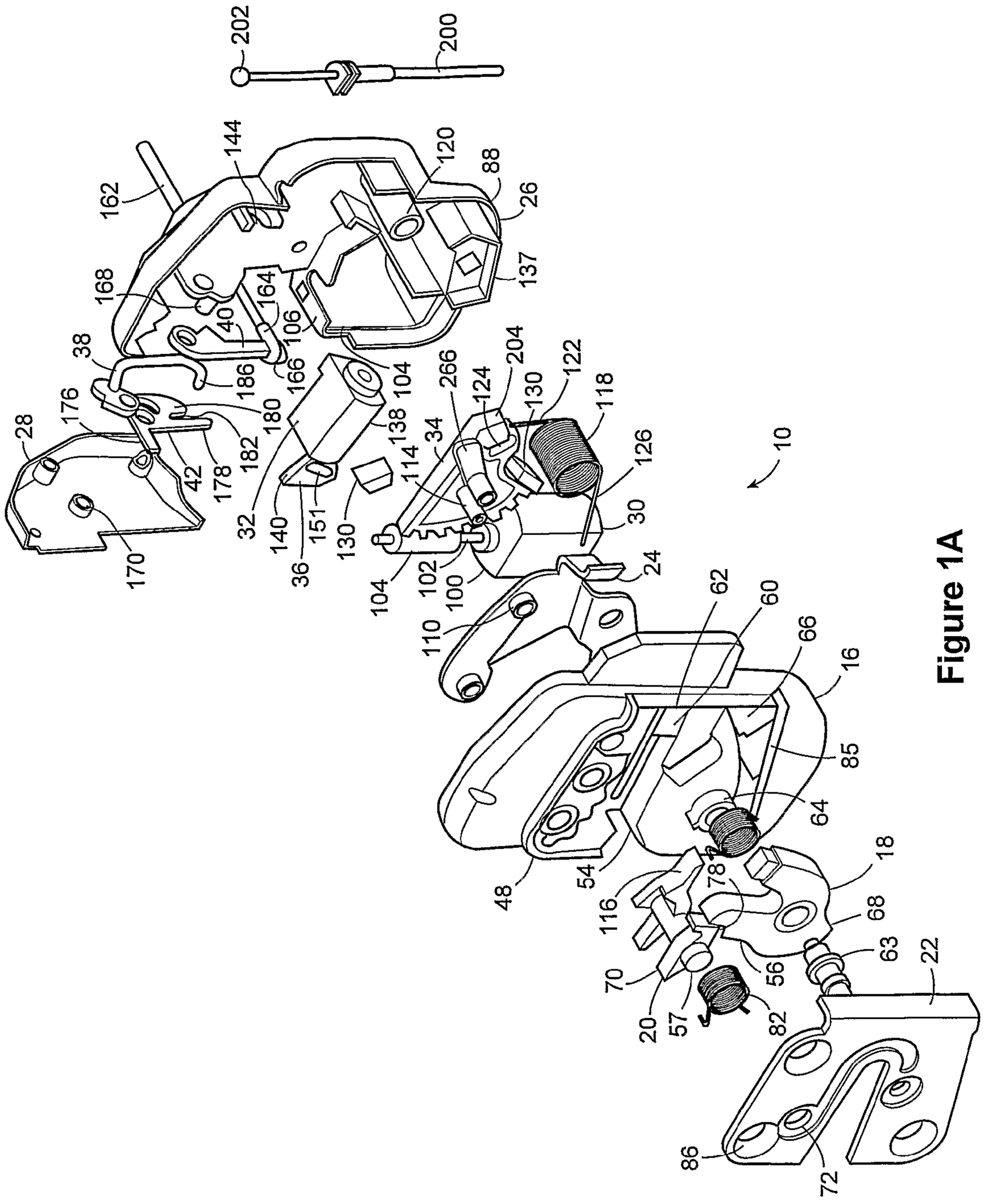
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130
122
118
28
182
34
114
126
42
178
32
140
151
130
36
102
100
104
110
10
30
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62
60
66
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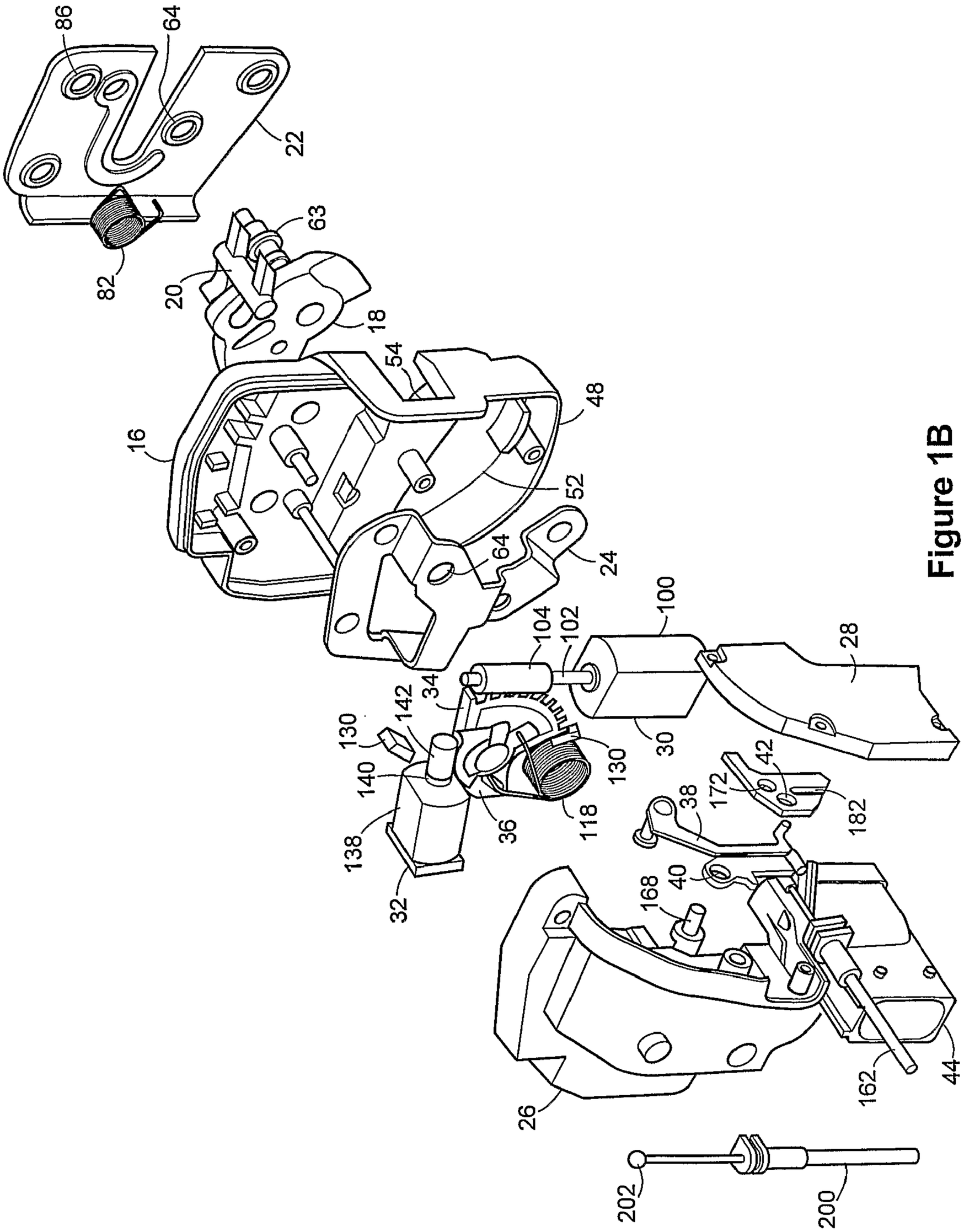
86
72

Figure 1A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130
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172
38
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138
36
118
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168
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162
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202
200

Figure 1B

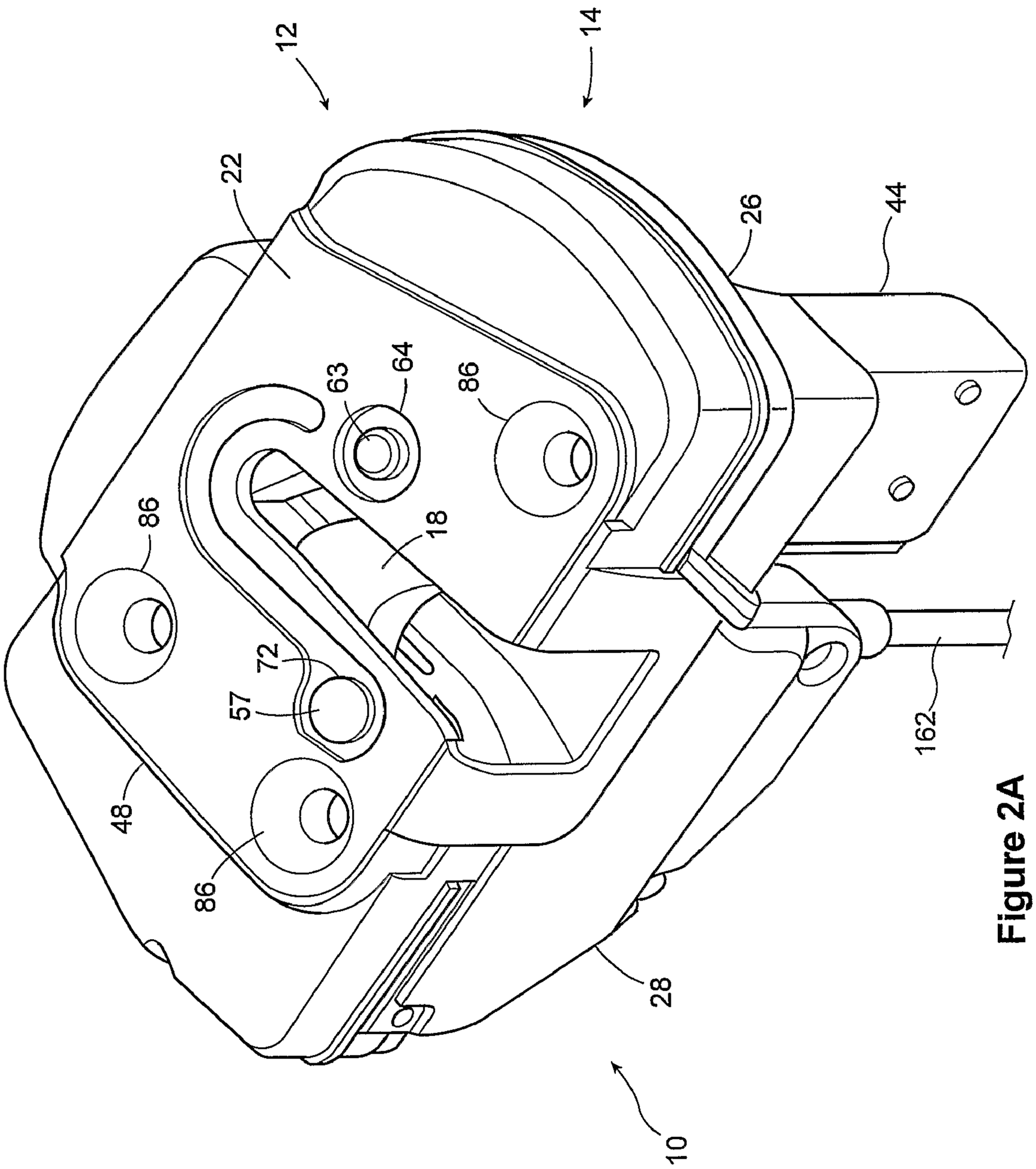


Figure 2A

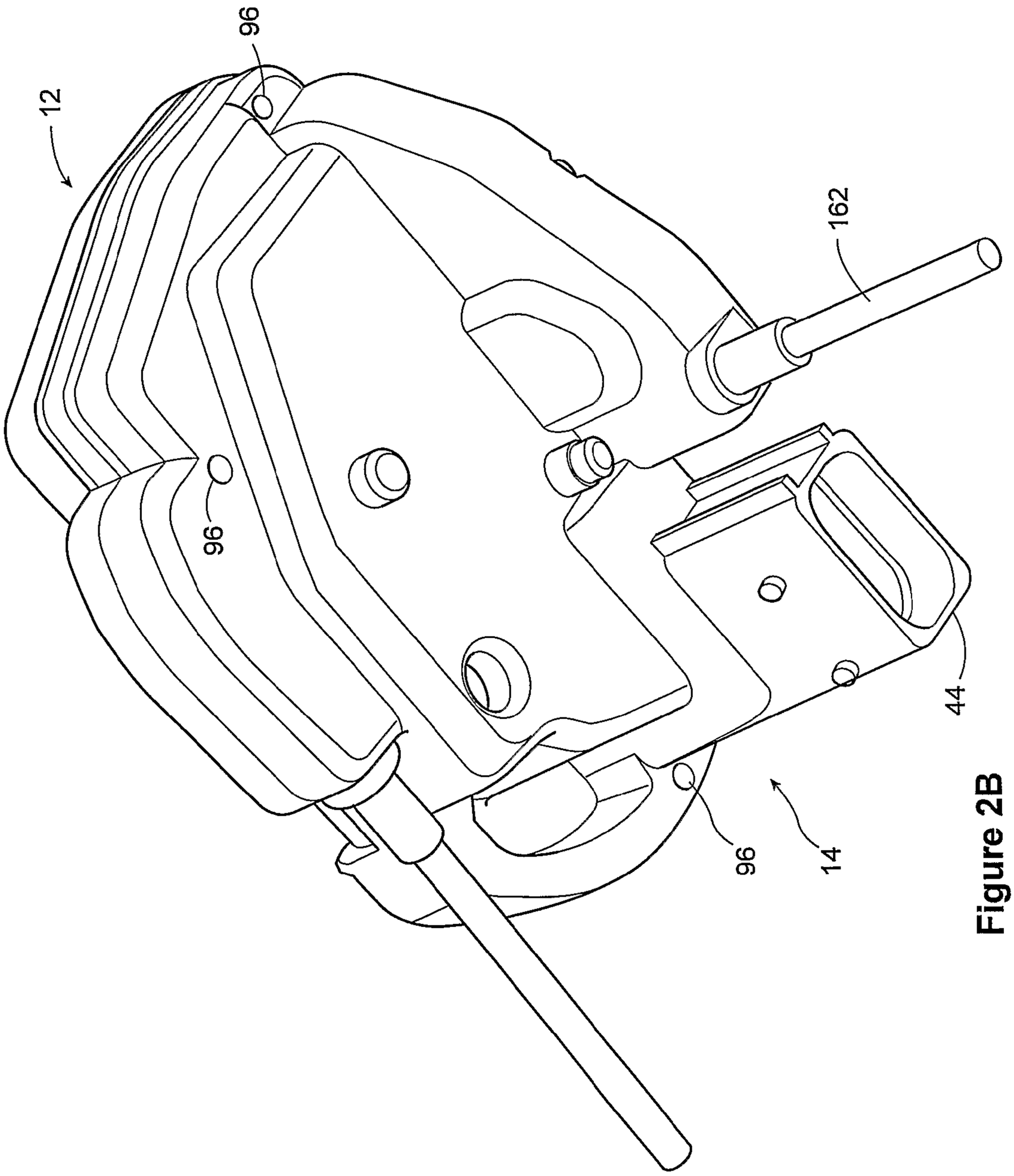
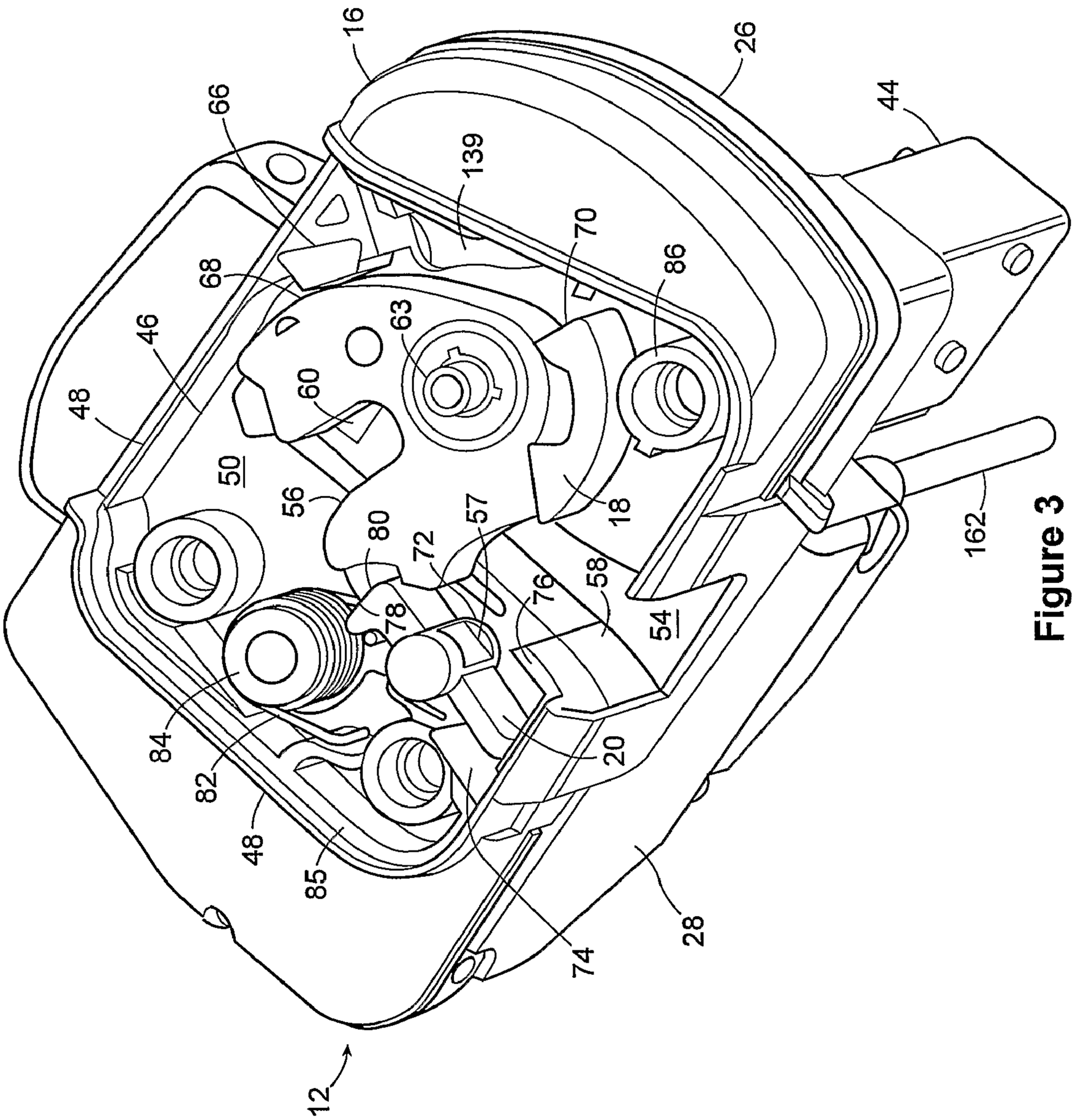


Figure 2B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74
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12
162

Figure 3

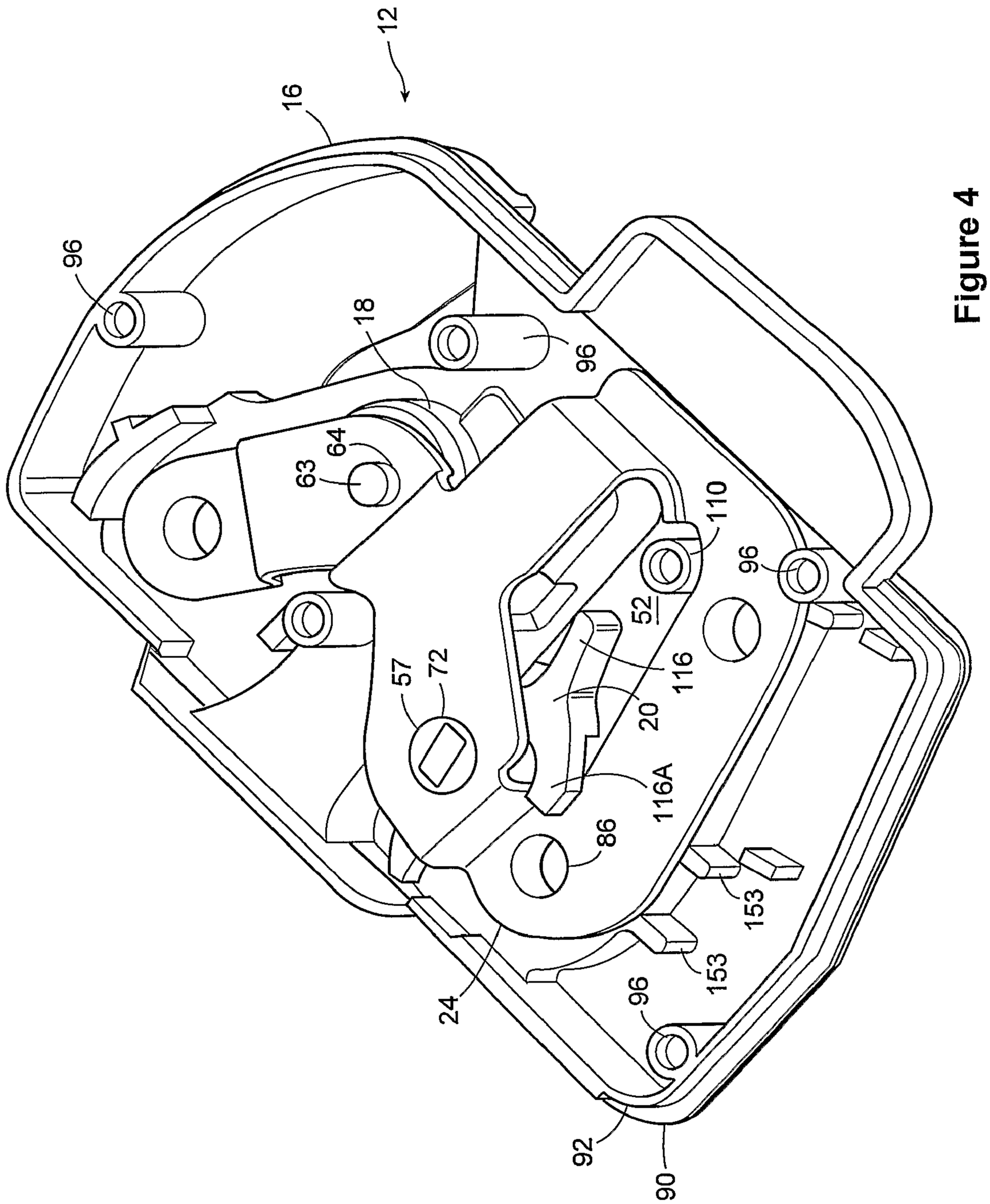
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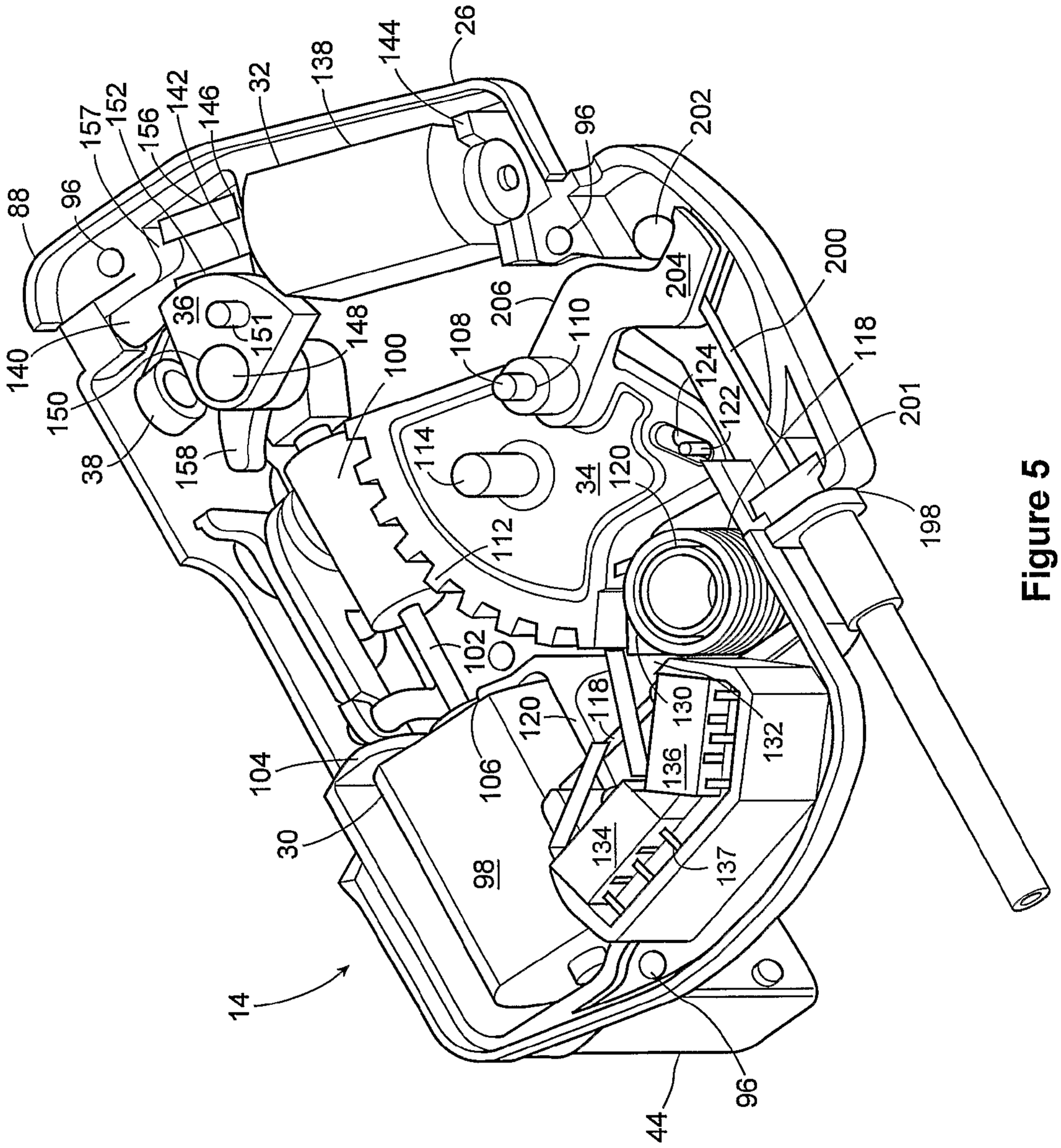
Figure 4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144
146
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Figure 5

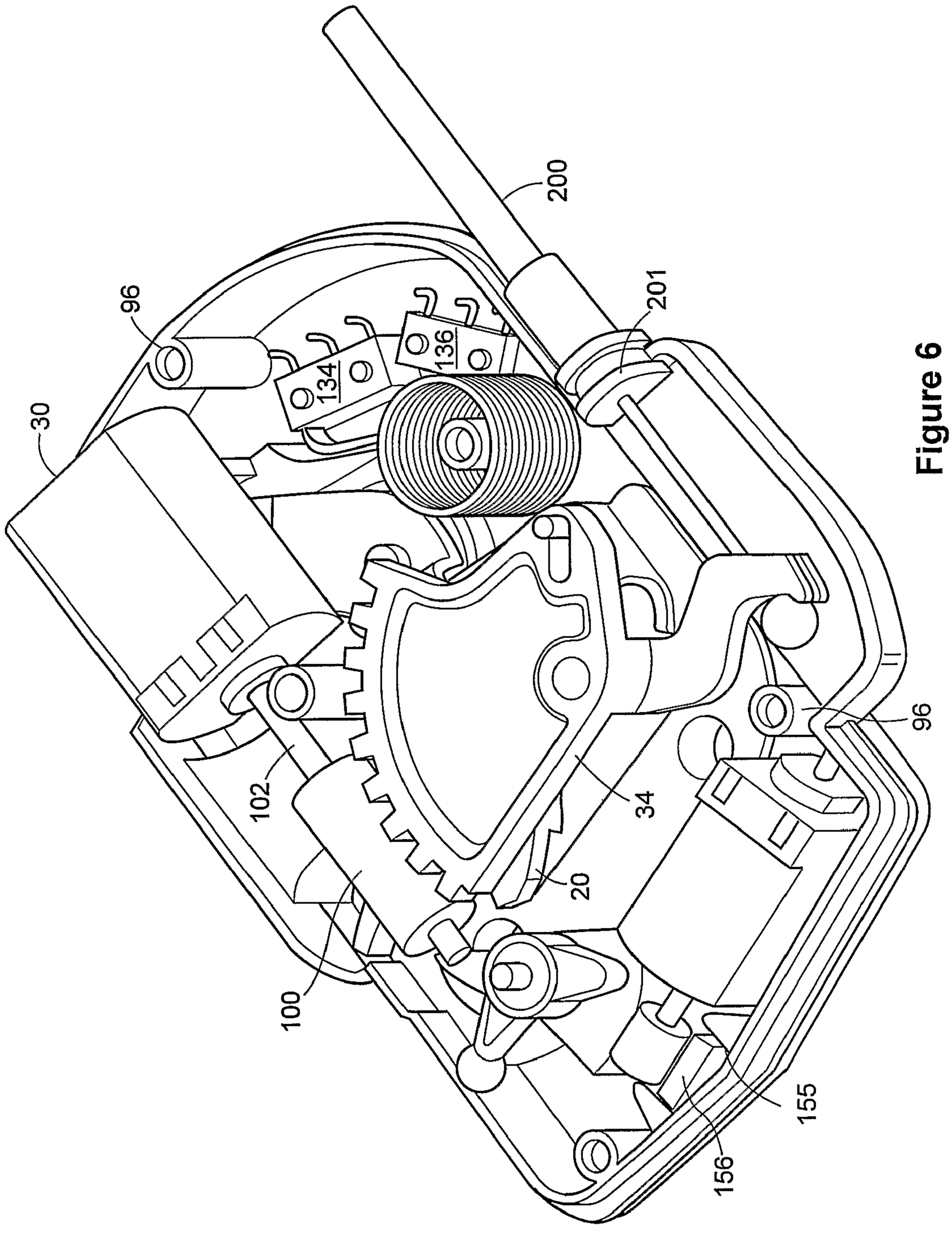

Figure 6

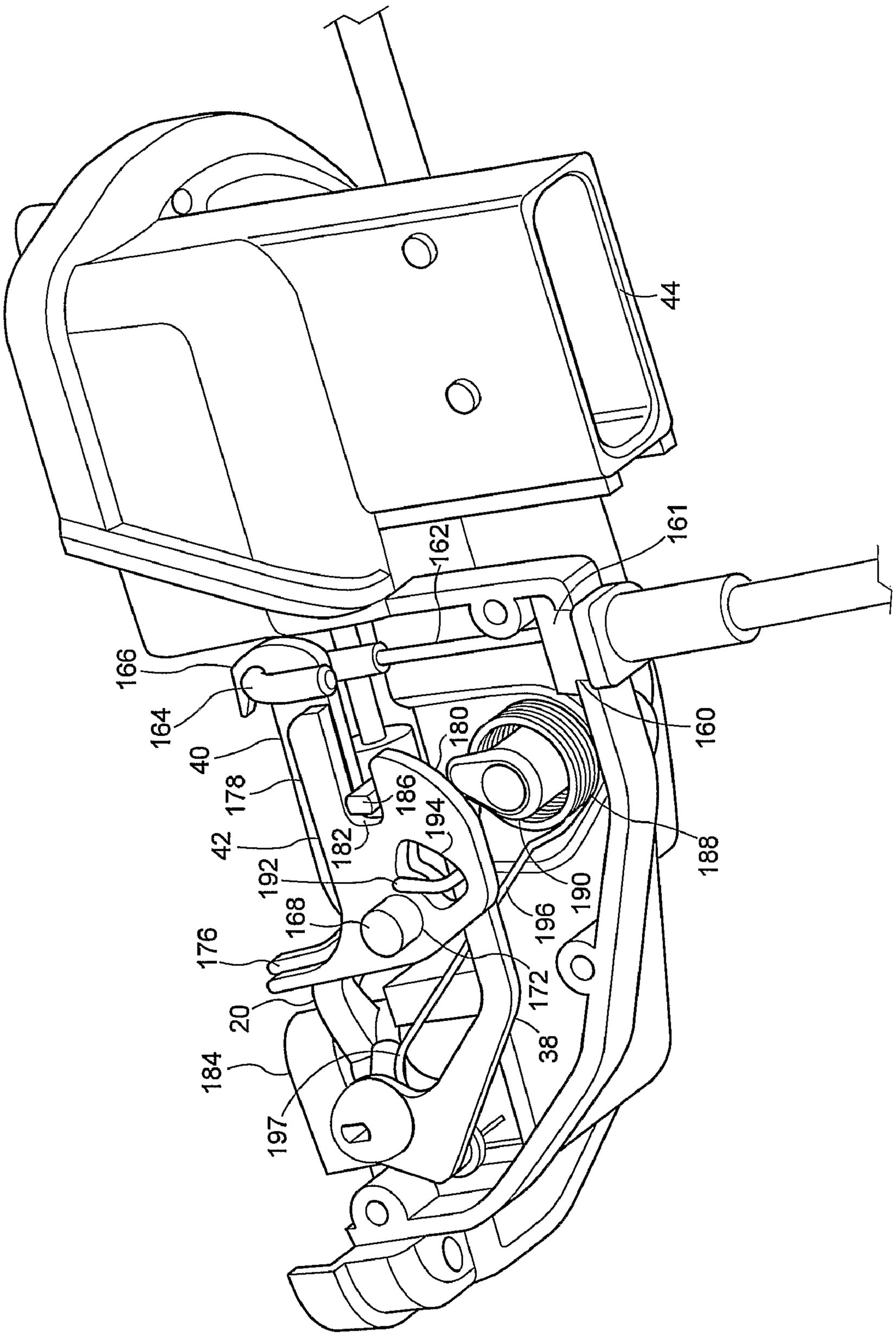
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Figure 7

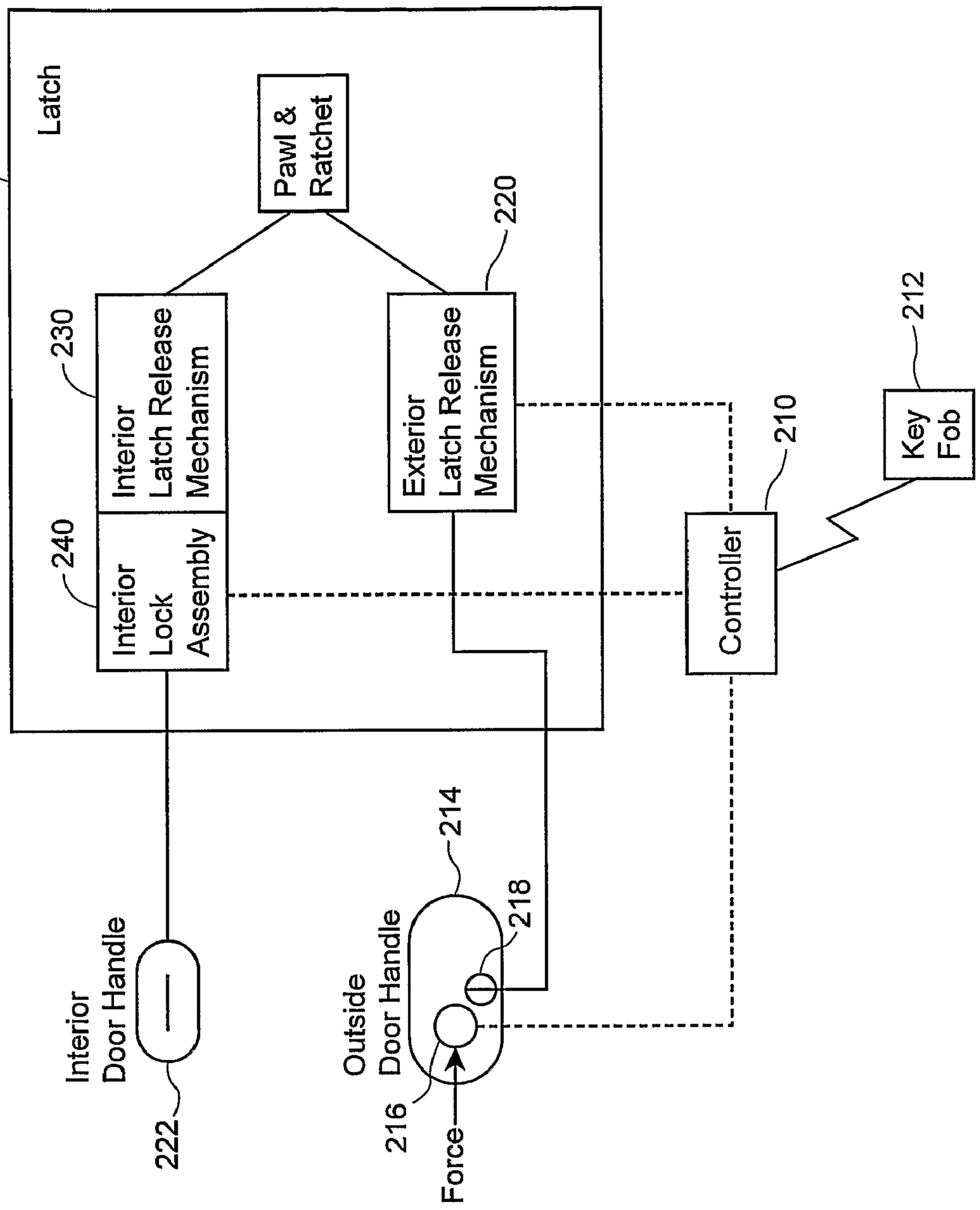
10
Latch
Pawl & Ratchet
220
230
Interior Latch Release Mechanism
Exterior Latch Release Mechanism
240
Interior Lock Assembly
210
Controller
212
Key Fob
214
Interior Door Handle
222
Outside Door Handle
216
218
Force

Figure 8

POWER RELEASE DOUBLE-LOCKING LATCH

FIELD OF ART

The invention generally relates to the field of automotive door latches or locks, and more particularly to power released, double-locking latches.

BACKGROUND OF INVENTION

Power release double-locking latches are known in the art. Such latches typically operate in conjunction with an outside door handle which has a mechanical lever that must be pulled open by the user. The actuation of the outside door handle lever is sensed by a controller, which then energizes a motor assembly for power release of the door latch. Because the power release double-locking latch typically mimics the operation of conventional manual latches, it becomes difficult to reduce the number of parts in such latches. The invention provides a more economical and sleek design for a power-release double-locking latch.

SUMMARY OF INVENTION

According to one aspect of the invention, a door lock system, including a latch, is provided for an automotive door. The latch includes a ratchet biased to a latched position and moveable to a released position, a pawl biased to engage the ratchet in the latched position, and an electro-mechanical exterior latch release mechanism for actuating the pawl to release the ratchet. The system also includes a controller, and a pressure sensitive switch, electrically connected to the controller, which is mounted on, in or proximate to an outside door handle of the automotive door. The controller is programmed to disable the pressure sensitive switch in response to a predetermined "lock" signal and enable the pressure sensitive switch in response to a pre-determined "unlock" signal, in which case the controller energizes the exterior latch release mechanism to release the ratchet in the event the pressure sensitive switch is actuated.

According to a further aspect of the invention, a latch is provided which includes: a housing; a ratchet, pivotally mounted to the housing, the ratchet being biased to a latched position and moveable to a released position; a pawl pivotally mounted to the housing and biased to engage the ratchet in the latched position; a first sector gear, pivotally mounted in the housing, for actuating the pawl to release the ratchet; a first motor assembly mounted in the housing for selectively driving the first sector gear; an arm rigidly connected to or integral with the first gear; and a cable connected to the arm for manually actuating the first sector gear and pawl, wherein the arm freewheels when the first sector gear is actuated by the first motor assembly.

According to a further aspect of the invention, a latch is provided which includes: (a) a latch housing having a first and a second surface, the first surface having a channel adapted to receive a striker; (b) a latch cover adapted to cooperate with the upper housing to form an interior cavity; a ratchet and pawl, each of the ratchet and pawl pivotally mounted to the first surface and a portion of the pawl extending into the interior cavity, the ratchet and pawl cooperatively operable to move between a latched position to hold the striker in the channel, and a released position to permit the striker from exiting the channel, the ratchet and pawl being biased towards the latched position; (c) an exterior latch release mechanism, mounted to the lower housing within the cavity, comprising a first means for actuating the pawl to release the ratchet and a first electromechanical means for selectively actuating the first pawl-actuating means; (d) an interior latch release and locking assembly, mounted to the lower housing within the cavity, comprising a second means for actuating the pawl to release the ratchet, means for connecting an inside release handle, and a second electromechanical means for selectively coupling or de-coupling the second pawl-actuating means from the handle-connecting means, the interior latch release and locking assembly being selectively operable to move between an unlocked state, wherein the handle-connecting means is kinematically coupled to the second pawl-actuating means, and a locked state, wherein the handle-connecting means is decoupled from the second pawl-actuating means; and (e) means comprising an arm on the pawl for driving the second electromechanical means into the unlocked state from the locked state, whenever the pawl is actuated to release the ratchet.

BRIEF DESCRIPTION OF THE DRAWINGS

The foregoing and other aspects of the invention will be understood and appreciated more fully from the following detailed description taken in conjunction with the following drawings, in which:

FIGS. **1**A and **1**B are exploded views of a double-locking latch, taken from reverse angles;

FIGS. **2**A and **2**B are perspective views of the latch shown in FIGS. **1**A and **1**B, taken from reverse angles;

FIG. **3** is a front perspective view of an upper portion of the latch shown in FIG. **2**A, with its front faceplate removed;

FIG. **4** is a rear perspective view of the upper portion of latch shown in FIG. **2**A;

FIG. **5** shows a front perspective view of the interior of a lower portion of the latch shown in FIG. **2**B;

FIG. **6** shows a rear perspective view of the interior of the lower portion of the latch shown in FIG. **2**B;

FIG. **7** shows a side perspective view of the lower portion of the latch shown in FIGS. **5** and **6**, with a side plate removed; and

FIG. **8** is a schematic, system block diagram of the double-locking latch and its control inputs.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

FIG. **8** shows a double-locking latch **10** in system-block form, comprising:

- a pawl and ratchet combination;
- an electromechanical exterior latch release mechanism **220** (the main elements of which are seen best in FIG. **5** and include a motor assembly **30**, which drives a sector gear **34** having a projection **100** that interacts with the pawl);
- a substantially separate interior latch release mechanism **230** (the main elements of which are seen best in FIG. **7** and include a cable **162** (connectable to inside door handle **222**), an inside release lever **40**, an auxiliary inside release lever **42** which interacts with the pawl, and a door lock link **38** coupling levers **40** and **42**); and
- an electro-mechanical interior lock assembly **240** (the main elements of which are seen best in FIGS. **5** and **7** and include a motor assembly **32** and sector gear **36**, which control the door lock link **38** in order to selectively de-couple the inside release lever **40** from the auxiliary inside release lever **42**).

As further shown in FIG. **8**, the control inputs to the latch **10** comprise an inside door handle **222**, an outside door

handle **214**, an electronic controller **210**, and a device for signaling the electronic controller, such as a key fob **212**.

In the illustrated system, the inside door handle **222** is a conventional door handle having a lever mechanically linked to the latch (via cable **162**), whereby actuating the inside door handle lever induces a corresponding movement to a lever (inside release lever **42**) in the interior latch release mechanism **230**. The outside door handle **214**, however, includes or is associated with a force or pressure sensitive switch **216** instead of a moveable lever. The switch **216** is connected to the controller **210** in order to provide a signal to unlock and release the latch. Upon receipt of this signal, the controller **210** energizes the exterior latch release mechanism **220** to activate the pawl and release the ratchet. Conversely, the controller **210** can lock the latch **10** from the outside, e.g., in response to a "lock" signal from the key fob **212**, by simply disabling the pressure sensitive switch **216** or otherwise ignoring the input therefrom. Likewise, the controller **210** enables input from the pressure sensitive switch in response to a pre-determined signal, such as an "unlock" signal from the key fob **212**. Accordingly, the illustrated system not only eliminates the need to pull a lever on the outside door handle, but it should also be appreciated that the system eliminates the need for an exterior lock assembly and its corresponding lock button or knob in the passenger compartment for the control thereof.

In the event of a power or controller failure, however, the outside door handle **214** does include or is otherwise associated with a key cylinder **218**, which is mechanically coupled to the exterior latch release mechanism in order to activate the pawl to release the ratchet, as discussed in greater detail below.

From the interior, latch **10** is locked by mechanically de-coupling the inside door handle **222** from the interior latch release mechanism **230**. This is electro-mechanically controlled by the interior lock assembly **240**, which is selectively energized by the controller **210**, as discussed in greater detail below. The latch **10** is "double locked" when the inside door handle **222** is de-coupled from the interior latch release mechanism **230** and the pressure sensitive switch **216** is disabled. This is useful for a variety of functions, as discussed in greater detail below.

Referring now to FIGS. **1-7**, the double-locking latch is shown generally at **10**. The latch **10** includes an upper latch portion **12** and a lower latch portion **14**. The upper latch portion **12** includes a latch housing **16**, a ratchet **18**, a pawl **20**, a front plate **22** and a backplate **24**. The lower latch portion **14** includes a latch cover **26**, a side plate **28**, and the majority of the components associated with the exterior latch release mechanism **220**, the interior latch release mechanism **230**, and the interior lock assembly **240**. The lower latch portion **14** also includes an electrical connector **44**. Both latch housing **16** and lower latch cover **26** are preferably formed from a rigid thermoplastic material.

Referring now specifically to FIGS. **3** and **4**, latch housing **16** includes a substrate **46** and peripheral walls **48** which define a cavity **50**, and on the opposite side of substrate **46**, a cavity **52**. Ratchet **18** and pawl **20** are disposed in cavity **50**. The metal backplate **24** is mounted to substrate **46** over cavity **52** using conventional fasteners, and provides reinforcement to the upper latch portion as well as a mounting surface for pawl **20** and ratchet **18**. A frusto-trapezoidal channel, referred to as a "fishmouth" **54**, bisects substrate **46**. Fishmouth **54** is designed to receive a striker (not shown) which engages a hook **56** of the ratchet **18**, as known in the art per se. Preferably, an elastomeric or rubber bumper **60** is mounted at the apex end of the fishmouth **38**, abutting peripheral wall **62**. The bumper **60** functions to receive and absorb the impact of the striker thus reducing the stresses on the latch and reducing noise.

Ratchet **18** is pivotally mounted to substrate **46** via a pin **63** inserted into aligned holes **64** (FIG. **1**A) in substrate **46**, front plate **22** and backplate **24**, and is rotatable between a "latched" or "engaged" position, where the hook **56** is substantially perpendicular to fishmouth **54** to bar the striker from exiting fishmouth **54**, and a "released" position, where the hook **56** is substantially parallel to fishmouth **54** as to permit free motion of the striker. The angular travel of ratchet **18** is delimited by the ratchet bumper **66**, which is mounted into a niche of peripheral wall **48** and receives impact force from ratchet **18**. A rear shoulder **68** of ratchet **18** strikes ratchet bumper **66** when ratchet **18** rotates into the engaged position, and a stop arm **70** of ratchet **18** strikes ratchet bumper **66** when ratchet **18** rotates into the released position.

Pawl **20** is pivotally mounted to latch housing **16** by a pawl axle **57** that is inserted into aligned holes **72** in front plate **22** and backplate **24**. The angular travel of pawl **20** is delimited by a pawl bumper **74** and a wall segment **76** of peripheral wall **48**, and provides an "engaged" position, where a pawl shoulder **78** abuts a hook shoulder **80** on ratchet **18** (forcing ratchet **18** into its engaged position), and a "released" position, where ratchet **18** rotates into its released position. A torsion spring **82** is installed around a post **84** formed in substrate **46** in order to bias pawl **20** in the engaged position.

Ratchet **18** and pawl **20** are preferably constructed out of metal but covered with a plastic material in order to reduce noise during operation. Certain portions subject to wear, such as pawl shoulder **78** and hook shoulder **80** are not covered by plastic.

Referring back to FIG. **2**A and **3**, front plate **22** is mounted on a lip **85** of latch housing **16** and provides a tight seal against peripheral walls **48**. Front plate **22** is secured in place via bolts or screws that pass through aligned fastener holes **86** formed in front plate **22**, latch housing **16** and back plate **24** (FIG. **4**). A sidewall **88** on lower latch cover **26** (FIG. **5**) engages against a lip **90** and further abuts a sidewall **92** on latch housing **16** (FIG. **4**) to ensure a tight seal between latch housing **16** and latch cover **26** when the two are mounted together. The upper latch portion **12** is secured to the lower latch portion **14** by a plurality of cover screws **94** that are threaded through aligned reinforced cover holes **96** on both latch cover **26** and latch housing **16**.

As previously mentioned, both the exterior and the interior latch release mechanisms **220**, **230** act upon pawl **20** to release ratchet **18**. The exterior latch release mechanism **220**, manipulated by the outside door handle **214**, is substantially separate from the interior latch release mechanism **230**, which is actuated by the inside door handle **222**.

The exterior latch release mechanism **220** is discussed greater detail with specific reference to FIGS. **5** and **6**. The mechanism **220** includes a power release motor assembly **30**, which comprises a motor **98** coupled to a worm **100** by a shaft **102**. Worm **100** drives a power release sector gear **34** (described in greater detail below). Motor **98** is mounted in a motor housing **104** that includes a shaft gap **106** in the sidewall of motor housing **104**. Power release motor assembly **30** is electrically connected via electrical connector **44** to the force or pressure sensitive switch **216** mounted to the outside door handle **214**. When the latch is electronically unlocked, the switch **216** signals the controller **210** to energize the power release motor assembly **30** upon the application of force or pressure to the outside door handle **214**. When the door is electronically locked, the switch **216** is disabled. Other types of outside door handle switches will occur to

those of skill in the art. The door may be electronically locked when a user activates a door lock/unlock switch inside the vehicle, on remote key fob **212**, or optionally, via the controller **210** once the vehicle begins to move. The door may be electronically unlocked when the user activates a door lock/unlock switch inside the car, or on the remote key fob.

Power release sector gear **34** is rotatably mounted to the surface of latch cover **26** by a pin **108** that snaps into aligned sector mount holes **110** provided on latch cover **26** (not shown), power release sector gear **34**, and latch housing **16** (FIG. **4**). The rotational path of power release sector gear **34** defines a "resting" position where power release sector gear **34** is closest to motor **98**, and an "activated" position where power release sector gear is furthest away from motor **98**. The teeth **112** of power release sector gear **34** are coupled with worm **100** so that engaging motor **98** rotates power release sector gear **34** towards the activated position. A projection **114** extends out perpendicularly from the surface of power release sector gear **34** and abuts against a sector arm **116** on pawl **20** (FIG. **4**). As power release sector gear **34** rotates into the activated position, pawl **20** is actuated by projection **114** into its released position, releasing ratchet **18**.

A power release return spring **118** is mounted to a post **120** formed in latch cover **26** and biases power release sector gear **34** into its resting position. A hooked spring arm **122** extends from power release return spring **118** and hooks into a tab slot **124** in power release sector gear **34**. A straight spring arm **126** also extends outwards from power release return spring **118** and abuts a wall portion **128** of latch cover **26**. As power release sector gear **34** rotates to the activated position, the position of tab slot **124** also moves to so that hooked spring arm **122** abuts the sidewall of tab slot **124**. Then, as power release sector gear **34** continues to rotate, power release return spring **118** rotates in the opposite direction, compressing straight spring arm **126**. As soon as power release motor assembly **30** disengages, straight spring arm **126** decompresses and power release return spring **118** urges power release sector gear **34** back into the resting position. A pair of power release bumpers **130** are mounted in a pair of niches **132** in latch cover **26** to absorb the impact of power release sector gear **34** in both the resting position and the activated position.

A door ajar switch **134** and a door open switch **136** are mounted into a switch niche **137** formed in latch cover **26**. As ratchet **18** rotates into the open position (FIG. **2**A), a cam **70** on ratchet **18** rotates through an opening **139** in latch housing **16**, first triggering a door ajar switch **134** and then a door open switch **136**. Door ajar switch **134** and door open switch **136** have a plurality of terminals that are attached to a wiring harness (not shown) that is preferably electrically connected to indicators (audio and visual) in the vehicle cabin via electrical connector **44**.

The interior latch release mechanism **230** and interior lock assembly **240** are discussed greater detail with specific reference to FIGS. **5** to **7**. The interior latch release mechanism **230** includes inside release lever **40**, auxiliary inside release lever **42**, and door lock link **38**, whereas interior lock assembly **230** includes motor assembly **32**, sector gear **36**, and door lock link **38**.

Door lock motor assembly **32** includes a reversible motor **138** coupled to a worm **140** by a shaft **142**. Motor **138** is connected to controller **210** via electrical connector **44**, and operable by remote key fob **212** or other signal-providing device. When energized, motor assembly **32** selectively drives sector gear **36** into a "locked" or "unlocked" position (described below). Motor **138** is mounted in a motor housing **144** that provides a shaft gap **146** in the sidewall of motor housing **144**.

Sector gear **36** is rotatably mounted to the latch cover **26** by a pin **148** that snaps into aligned sector mount holes **150** provided on latch cover **26** (not shown) and sector gear **36**. The teeth **152** of sector gear **36** are coupled with worm **140** so that engaging motor **138** selectively rotates sector gear **36** into its "locked" position, where the sector gear **36** is furthest from motor **138**, or its unlocked position, where the sector gear **36** is closest to motor **138**. The angular travel of sector gear **36** is delimited by a pin **151** that extends from the surface of the gear **36** and abuts one of a pair of sector tabs **153** that depend from the lower surface of substrate **46** (FIG. **4**). A door lock arm **154** extends outwards from the sector gear **36** (FIG. **1**B). When the sector gear **36** rotates into the locked position, door lock arm **154** engages a door lock switch **155** that is mounted in a niche **156** in latch cover **26**. When the sector gear **36** rotates into the unlocked position, door lock arm **154** disengages from door lock switch **155**. Door lock switch **155** has a plurality of terminals that are attached to a wiring harness (not shown) that is electrically connected to indicators (audio and visual) in the vehicle cabin via electrical connector **44**.

Referring now to FIG. **7**, a cable hole **160** is provided in latch cover **26** to provide access for inside handle release cable **162** from outside of latch cover **26**. A flange **161** provided at the end of the cladding ensures a tight seal. One end of inside handle release cable **162** is coupled with the inside handle **222** of the vehicle door (not shown). The other end of inside handle release cable **162** terminates in a hook **164** that is coupled with a hook end **166** of inside release lever **40**. Inside release lever **40** is rotatably mounted to a post **168** on lower cover **26** (FIG. **1**B), so that actuating inside handle release cable **162** rotates inside release lever **40**. Post **168** terminates in a hole **170** on side plate **28** (FIG. **1**A).

Auxiliary inside release lever **42** includes an integrally formed hole **172** that allows auxiliary inside release lever **42** to rotatably mount to post **168** between inside release lever **40** and side plate **28**. Auxiliary inside release lever **42** further includes a pawl arm **176**, a link arm **178** and a door lock hook **180**. Pawl arm **176** abuts pawl **20**, so that when auxiliary inside release lever **42** is rotated around hole **174**, pawl **20** is actuated into its released position. A slot **182** is formed in auxiliary inside release lever **42** between link arm **178** and door lock hook **180**. Link arm **178** is longer than door lock hook **180**.

Door lock link **38** is pivotally coupled at a first end to a door lock arm **184** on sector gear **36** (FIG. **1**B), kinematically coupled with inside release lever **40** at the second end, and is also selectively kinematically coupled with auxiliary inside release lever **42** at the second end. A depending tab **186** is provided at the second end of door lock link **38** that abuts both inside release lever **40** and auxiliary inside release lever **42**. Engaging door lock sector gear **36** moves door lock link **38** so that depending tab **186** slides into and out of slot **182** on auxiliary inside release lever **42**. When door lock sector gear **36** is in the unlocked position, door lock link **38** is in its "coupled" position, so that depending tab **186** is positioned within slot **182**, abutting both link arm **178** and door lock hook **180**. When door lock sector gear **36** is in the locked position, door lock link **38** is in its "uncoupled" position, so that depending tab **186** is outside of slot **182**, abutting only door lock link arm **178**. Thus, when inside release lever **40** is actuated while door lock link **38** is in its coupled position, inside release lever **40** pushes on depending tab **186**, causing both door lock link **38** and auxiliary inside release lever **42** to rotate, and thus have pawl arm **176** actuate pawl **20**. When

inside release lever **40** is actuated while door lock link **38** is in its uncoupled position, inside release lever **40** still actuates door lock link **38**. However, since depending tab **186** is now situated outside of slot **182**, auxiliary inside release lever **42** does not rotate and actuate pawl **20**.

An inside release spring **188** is mounted to a post **190** formed in latch cover **26** and biases auxiliary inside release lever **42** towards its engaged position. A hooked spring arm **192** extends from inside release spring **188** and hooks into a tab slot **194** in auxiliary inside release lever **42**. Another spring arm **196** also extends outwards from inside release spring **188** and is biased against a wall portion **197** of latch cover **26**. As auxiliary inside release lever **42** rotates clockwise, the position of tab slot **194** also moves to so that hooked spring arm **192** abuts the sidewall of tab slot **194**. Then, as auxiliary inside release spring **188** continues to rotate clockwise, inside release spring **188** counterclockwise, compressing spring arm **196**. As soon as inside handle release cable **162** disengages, spring arm **196** decompresses and inside release spring **188** urges auxiliary inside release lever **42** back into its held position.

Sector gear **36** further includes a safety backup arm **158**. When the sector gear **36** is in the locked position, safety backup arm **158** is positioned into the rotational path of an arm **116**A on pawl **20** (see FIG. **4**) so that, if actuated, pawl arm **116**A will force sector gear **36** into the unlocked position. When door lock sector gear **36** is in the unlocked position, safety backup arm **158** is not within the rotational path of pawl arm **116**A. In this manner, the exterior release latch mechanism **220** is mechanically coupled to the interior lock assembly **240**. Safety backup arm **158** provides a mechanical means to move sector gear **36** into the unlocked position from the locked position, and thus preclude the possibility of a person entering the passenger cabin and thereafter being unable to open the vehicle door from the interior due to the inside door handle **222** being decoupled from the interior latch release mechanism **230** as a result of a power failure or other problem with motor assembly **32**.

Referring back to FIG. **5**, a cable hole **198** is provided in latch cover **26** to provide access for an emergency key release cable **200**. A flange **201** provided at the end of the cladding ensures a tight fit. One end of emergency key release cable **200** is coupled to a lever in the key cylinder **218**, which is accessible from the exterior of the vehicle door. The other end of emergency key release cable **200** terminates in a ball hook **202** that abuts a hook end **204** of a manual arm **206** on power release sector gear **34**. When emergency key release cable **200** is actuated, manual arm **206** rotates power release sector gear **34** mechanically into the activated position. As described above, moving pawl **20** to the released position will also rotate sector gear **36** into the unlocked position if it is currently in the locked position. Additionally, as with the normal motor-powered opening of power release sector gear **34**, power release return spring **118** will urge power release sector gear **34** back into the resting position once emergency key release cable **200** is disengaged. During normal motor-powered opening of power release sector gear **34**, the manual arm **206** free-wheels without actuating emergency key release cable **200** or otherwise affecting the operation of the power opening/closing cycle.

If desired, since the emergency key release cable **200** is intended to be used only when there is no power available to engage power release motor **98**, the key cylinder **218** on the exterior of the vehicle may be hidden from view by a slidable cover to enhance the aesthetics of the door. The key cylinder may be mounted on, in, or otherwise in the general vicinity of the outside door handle, as desired.

In operation, pawl **20** can be actuated to allow ratchet **18** to move from the engaged position to the released position by: (a) actuating the inside release lever **40** when sector gear **36** is in the unlocked position; (b) energizing power release motor assembly **30** when sector gear **36** is in the unlocked position; or (c) actuating the emergency key release cable **200** regardless of whether or not the sector gear **36** is in the locked or unlocked position. Under the first option (a), when the sector gear **36** is in the unlocked position, actuating the inside release handle **22** moves inside handle release cable **162** and actuates inside release lever **40**, which, in turn, engages door lock link **38**. Depending tab **186** on door lock link **38** actuates auxiliary inside release lever **42**, which engages pawl **20** to release ratchet **18**. When the sector gear **36** is in the locked position, door lock link **38** freewheels without actuating auxiliary inside release lever **42**. Under the second option (b), power release motor assembly **30** drives power release sector gear **34**. A projection on power release sector gear **34** actuates sector arm **116** on pawl **20** to release ratchet **18**. Alternatively, under the third option (c), manually actuating emergency key release cable **200** by turning a key cylinder actuates power release sector gear **34** in lieu of power release motor assembly **30**.

Typically, unlocking the vehicle by pressing an unlock/lock control on a remote key fob causes the interior locking assembly **240** to enter into an unlocked state (by energizing door lock motor assembly **32** to move door lock sector gear **36** into the unlocked position) and enables the pressure sensitive switch **216** on the outside door handle **214**. Thus, both the exterior and the interior door handles are operable to open the latch. Unlocking the vehicle by pressing an unlock/lock control located (such as a rocker switch) inside the vehicle when it is in a locked state preferably only disables the pressure sensitive switch **216** on the outside handle **214**. Thus, double-locking can only be done by pressing lock/unlock button on the remote key fob. Unlocking the vehicle by pressing an unlock/lock button inside the vehicle that is in a double locked state preferably causes no change to the interior or exterior latch release mechanisms **220**, **230**.

It is contemplated that variations on the double-locking system will occur to those of skill in the art. For example, as a safety feature, the pressure sensitive switch **216** on each of the outside door handles of the vehicle could be electronically deactivated after the vehicle begins to move (auto lock feature). Alternatively, for each of the rear doors of a vehicle, door lock motor assembly **32** may not drive door lock sector gear **36** into the unlocked position unless a child lock switch is disengaged. This switch could be placed on a dashboard or in another location not accessible from the rear seat. Other variations will occur to those of skill in the art without departing from the spirit of the invention.

What is claimed is:

1. A door lock system for an automotive door, comprising:

a latch, including a ratchet (**18**) biased to a latched position and moveable to a released position, a pawl (**20**) biased to engage the ratchet in the latched position;

a controller (**210**);

an electromechanical exterior latch release mechanism (**220**) for actuating the pawl to release the ratchet;

an interior latch release mechanism (**230**) for actuating the pawl to release the ratchet;

an electromechanical interior locking assembly (**240**), electrically connected to the controller, for selectively decoupling the interior latch release mechanism from the pawl;

a pressure sensitive switch (**216**) actuatable by an outside door handle (**214**) of the automotive door and electrically connected to the controller;

wherein said controller is programmed to disable the pressure sensitive switch in response to a predetermined "lock" signal and enable the pressure sensitive switch in response to a pre-determined "unlock" signal, in which case the controller energizes the exterior latch release mechanism to release the ratchet in the event the pressure sensitive switch is actuated.

2. A system according to claim **1**, wherein the exterior latch release mechanism comprises a first gear (**34**) for actuating the pawl to release the ratchet and a first motor assembly (**30**), electrically connected to the controller, for driving the first gear (**34**).

3. A system according to claim **1**, including a key cylinder (**218**), mounted on, in or proximate to the outside door handle, the key cylinder being kinematically connected to the first gear (**34**) for mechanically actuating the pawl to release the ratchet.

4. A system according to claim **3**, wherein the key cylinder is connected to the first gear (**34**) via a cable (**200**) connected to an arm (**206**) rigidly connected to the first gear (**34**), the arm (**206**) freewheeling when the first gear (**34**) is actuated by the first motor assembly (**30**).

5. A system according to claim **4** including an inside door handle (**222**) connected to the interior latch release mechanism (**230**).

6. A system according to claim **5**, wherein the interior latch release mechanism comprises:

an inside release lever (**40**) pivotally mounted in the latch, the inside release lever being connected via a cable to the inside release handle;

an auxiliary release lever (**42**) pivotally mounted in the latch, the auxiliary release lever being engagable with the pawl; and

a link element (**38**) moveable between an unlocked position, wherein the inside release lever is kinematically coupled with the auxiliary release lever, and a locked position, wherein the inside release lever is kinematically de-coupled from the auxiliary release lever such that actuation of the inside release lever does not cause a corresponding movement of the auxiliary release lever.

7. A system according to claim **6**, wherein the electromechanical interior locking assembly comprises:

a second gear (**36**) connected to the link element; and

a second motor assembly (**32**), electrically connected to the controller, for driving the second gear (**36**) and the link element connected thereto between the locked and unlocked positions.

8. A system according to claim **7**, wherein the second gear (**36**) includes a safety backup arm (**158**) that is positioned into the rotational path of an arm (**116**A) on the pawl when the second gear (**36**) is in the locked position so that, if actuated, the pawl arm forces the second gear (**36**) and the link element into the unlocked position.

9. A system according to claim **5**, wherein the pawl couples the exterior latch release mechanism to the interior lock assembly.

10. A latch, comprising:

a housing;

a ratchet (**18**), pivotally mounted to the housing, the ratchet being biased to a latched position and moveable to a released position;

a pawl (**20**) pivotally mounted to the housing and biased to engage the ratchet in the latched position;

a first gear (**34**), pivotally mounted in the housing, for actuating the pawl to release the ratchet;

a first motor assembly (**30**) mounted in the housing for selectively driving the first gear (**34**);

an arm (**200**) rigidly connected to or integral with the first gear (**34**); and

a cable (**200**) connected to the arm for manually actuating the pawl, wherein the arm freewheels when the first gear (**34**) is actuated by the first motor assembly (**30**).

11. A latch according to claim **10**, including:

an inside release lever (**40**) pivotally mounted to the housing;

an auxiliary release lever (**42**), pivotally mounted to the housing, the auxiliary release lever being engagable with the pawl; and

a link element (**38**) moveable between an unlocked position, wherein the inside release lever is kinematically coupled with the auxiliary release lever, and a locked position, wherein the inside release lever is kinematically de-coupled from the auxiliary release lever such that actuation of the inside release lever does not cause a corresponding movement of the auxiliary release lever.

12. A latch according to claim **11**, including:

a second gear (**36**), pivotally mounted to the housing, and connected to the link element; and

a second motor assembly (**32**) mounted in the housing for selectively driving the second gear (**36**) and the link element connected thereto between the locked and unlocked positions.

13. A latch according to claim **12**, wherein the second gear (**36**) includes a safety backup arm (**158**) that is positioned into the rotational path of an arm (**116**A) on the pawl when the second gear (**36**) is in the locked position so that, if actuated, the pawl arm forces the second gear (**36**) and the link element into the unlocked position.

14. A latch for an automotive door, comprising:

a latch housing having a first and a second surface, the first surface having a channel adapted to receive a striker;

a latch cover adapted to cooperate with the latch housing to form an interior cavity;

a ratchet and pawl, each of the ratchet and pawl pivotally mounted to the first surface and a portion of the pawl extending into the interior cavity, the ratchet and pawl cooperatively operable to move between a latched position to hold the striker in the channel, and a released position to permit the striker to exit the channel, the ratchet and pawl being biased towards the latched position;

an exterior latch release mechanism, mounted to the lower housing within the cavity, comprising a first means for actuating the pawl to release the ratchet and a first electromechanical means for selectively actuating the first pawl-actuating means without a manually operable lever;

an interior latch release and locking assembly, mounted to the latch cover within the cavity, comprising a second means for actuating the pawl to release the ratchet, means for connecting an inside release handle to the second pawl-actuating means, and a second electromechanical means for selectively coupling or de-coupling the second pawl-actuating means from the handle-connecting means, the interior latch release and locking assembly being selectively operable to move between an unlocked state, wherein the handle-connecting means is kinematically coupled to the second pawl-actuating

means, and a locked state, wherein the handle-connecting means is decoupled from the second pawl-actuating means; and

means comprising an arm on the pawl for driving the second electro-mechanical means into the unlocked state from the locked state, whenever the pawl is actuated to release the ratchet.

15. A latch according to claim **14**, wherein:

the first electromechanical means includes an electric motor with a worm screw on the output shaft of the electric motor; and

the first pawl-actuating means includes a first gear, rotatably mounted to the surface of the latch housing within the cavity and coupled to the worm screw, and a pin, extending from the surface of the first gear and abutting a portion of the pawl extending into the interior cavity so that rotating the first gear actuates the pawl.

16. A latch according to claim **15**, wherein the first gear can be actuated by cable means, in addition to the first electromechanical means.

17. A latch according to claim **16**, wherein the cable means include an emergency cable coupled at a first end to the first gear and at a second end, a key cylinder, whereby rotating the key cylinder actuates the first gear.

18. A latch according to claim **17**, wherein the key cylinder is mounted to at least one of the exterior of a vehicle door and an outside vehicle door handle.

19. A latch according to claim **14**, wherein:

the second pawl-actuating means includes an auxiliary inside release lever, rotatably mounted to the lower housing within the cavity and operable to actuate the pawl;

the handle-connecting means comprises an inside release lever having a first end and a second end, the first end being rotatably mounted to the auxiliary inside release lever and the second end being connected to a cable;

the second electromechanical means includes an electric motor with a worm screw on the output shaft of the electric motor, a second gear rotatably mounted to the surface of the tower housing within the cavity, driven by the worm screw, and a door lock link, rotatably coupled at a first end to the second gear and moveable between a first position where the second end engages a hook on the auxiliary inside release lever so that actuating the door lock link also actuates the auxiliary inside release lever, and a second position where the second end is disengaged from the hook on the auxiliary inside release lever, so that the door lock link rotates freely.

20. A latch for an automotive door, comprising:

a latch housing having a channel adapted to receive a striker;

a ratchet and pawl, each of the ratchet and pawl pivotally mounted to the housing, the ratchet and pawl cooperatively operable to move between a latched position to hold the striker in the channel, and a released position to permit the striker to exit the channel, the ratchet and pawl being biased towards the latched position;

an exterior latch release mechanism including a first gear for actuating the pawl to release the ratchet and a first electromechanical assembly for selectively driving the first gear to release the ratchet without a manually operable lever;

an interior latch release and locking assembly including an inside release lever, an auxiliary inside release lever for actuating the pawl to release the ratchet, and a second electromechanical assembly for selectively coupling or de-coupling the auxiliary inside release lever with the inside release lever, said second electromechanical assembly including a motor, a second gear operatively coupled to the motor, and a door lock link rotatably connected at a first thereof end to the second gear and moveable between a first position where a second end of the link couples the auxiliary inside release lever with the inside release lever and a second position where the second end of the link does not couple the auxiliary inside release lever with the inside release lever; and

an arm on the pawl for driving the second electro-mechanical means into the unlocked state from the locked state, whenever the pawl is actuated to release the ratchet.

21. A latch according to claim **20**, including a cable connected to an arm of the first gear, the first gear arm freewheeling when the first gear is actuated by the first electromechanical assembly.

22. A latch according to claim **20**, including an electronic controller for actuating the first electromechanical assembly of the exterior latch release mechanism and a switch, engageable from the exterior of the vehicle, electrically connected to the controller for signaling actuation of the exterior release mechanism.

23. A latch according to claim **20**, including:

a controller;

a switch located on the exterior of the automotive door and electrically connected to the controller;

wherein said controller is programmed to disable the switch in response to a predetermined "lock" signal and enable the pressure sensitive switch in response to a pre-determined "unlock" signal, in which case the controller energizes the exterior latch release mechanism to release the ratchet in the event the pressure sensitive switch is actuated.

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